groups. The silane could thus be used to link heparin molecules to the substrate in a manner similar to the silane of isocyanate functionality disclosed herein. Heparin could then be prepared with an aldehyde positive group that mixed with an NH2 group to provide an end linkable to heparin without affecting its activity. The procedure to make degraded heparin is well known to those of ordinary skill in the art.

A coating system may also be provided in which heparin can be covalently linked or can be incorporated into a matrix to obtain variable rate of elution. A silicon fluid, such as Dow Corning MDX 4-4159 is used, with the active silicon being an amino functional polydimethyl siloxane copolymer. The coating may be used to coat stainless steel guide wires. This working can be utilized for heparin covalent-bonding as described below.

First, a solution of heparin (deaminated) in water or other solvent may be provided. A wire coated with a silicon fluid in a solvent may be placed in the solution for some time, for example two hours. The heparin has an aldehyde group that can link to the amino functionality in the silicon copolymer. Other amino functionalized silicon polymers, or copolymers, can be used to achieve covalent bonding of heparin to the substrate.

Equivalents

While the invention has been disclosed in connection with the preferred embodiments shown and described in detail, various modifications and improvements thereon will become readily apparent to those skilled in the art. Accordingly, the spirit and scope of the present invention is to be limited only by the following claims.

We claim:

**1**. A medical device having a coating comprising the product of the reaction of:

a silane having at least one functional group selected from the group consisting of an isocyanate, an isothiocvanate, an ester, an anhydride, an acyl halide, an alkyl halide, an epoxide and an aziridine; and

a biopolymer.

**2**. The medical device of claim **1**, wherein the weight ratio of said silane to said biopolymer is from about 1:4 to about 2:1.

**3**. The medical device of claim **2**, wherein said weight ratio is 1:4, 1:1 or 2:1.

**4**. The medical device of claim **2**, wherein said biopolymer is heparin or a complex thereof.

**5**. The medical device of claim **4**, wherein said biopolymer is selected from the group consisting of heparin-tridodecylmethylammonium chloride, heparin-benzalkonium chloride, heparin stearalkonium chloride, heparin-poly-N-vinyl-pyrrolidone, heparin lecithin, heparin-didodecyldimethyl ammonium bromide, heparin-pyridinium chloride and heparin-synthetic glycolipid.

**6**. The medical device of claim **2**, further comprising at least one additive selected from the group consisting of wetting agents, surface active agents and film forming agents.

**7**. The medical device of claim **6**, wherein said film-forming agent is selected from the group consisting of cellulose esters, polydialkyl siloxanes, polyurethanes, acrylic polymers, elastomers, biodegradable polymers, polylactic acid, polyglycolic acid, copolymers of polylactic acids, copolymers of polyglycolic acid and poly(e-caprolactone).

**8**. The medical device of claim **1**, wherein said device is selected from the group consisting of stents, catheters, prostheses, tubing and blood storage vessels.

**9**. The medical device of claim **8**, wherein said device is made of at least one material selected from stainless steel, nitinol, tantalum, glass, ceramic, nickel, titanium or aluminum.

**10**. The medical device according to claim **1**, wherein said at least one functional group is an isocyanate.

**11**. The medical device according to claim **10**, wherein said biopolymer is heparin or a complex thereof.

**12**. The medical device according to claim **11**, wherein said biopolymer is selected from the group consisting of heparin-tridodecylmethylammonium chloride, heparin-benzalkonium chloride, heparin stearalkonium chloride, heparin-poly-N-vinyl-pyrrolidone, heparin lecithin, heparin-didodecyldimethyl ammonium bromide, heparin-pyridinium chloride and heparin-synthetic glycolipid.

**13**. The medical device according to claim **12**, wherein said biopolymer is heparin-tridodecylmethylammonium chloride.

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